

INTERCONNECT SERVICES MARKET STUDY

INPUT

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INTERCONNECT SERVICES MARKET STUDY

Prepared For:

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COMMUNICATIONS SWITCHING
SYSTEMS DIVISION

OCTOBER 1982

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INTERCONNECT SERVICES MARKET STUDY

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INTERCONNECT SERVICES MARKET STUDY

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I INTRODUCTION

I INTRODUCTION

A. OBJECTIVES

- This study, prepared by INPUT for Rockwell International, provides a current analysis of service offerings in the PBX and ACD interconnect industry.
- Benchmarks and trends are established for:
 - Market characteristics.
 - Resources.
 - Service offerings and pricing.
 - Logistics.

B. METHODOLOGY AND SCOPE

- Sources of information for the study included:
 - Manufacturers or resellers of PBX and ACD equipment.

- Other INPUT studies.
- Library research.
- A survey was conducted using a questionnaire developed mutually by INPUT and Rockwell.
 - The questionnaire contained 98 questions.
 - All interviews were conducted by telephone. Eighteen interviews were completed; 30 were attempted.
 - Confidentiality was insured for Rockwell and respondents.

II EXECUTIVE SUMMARY

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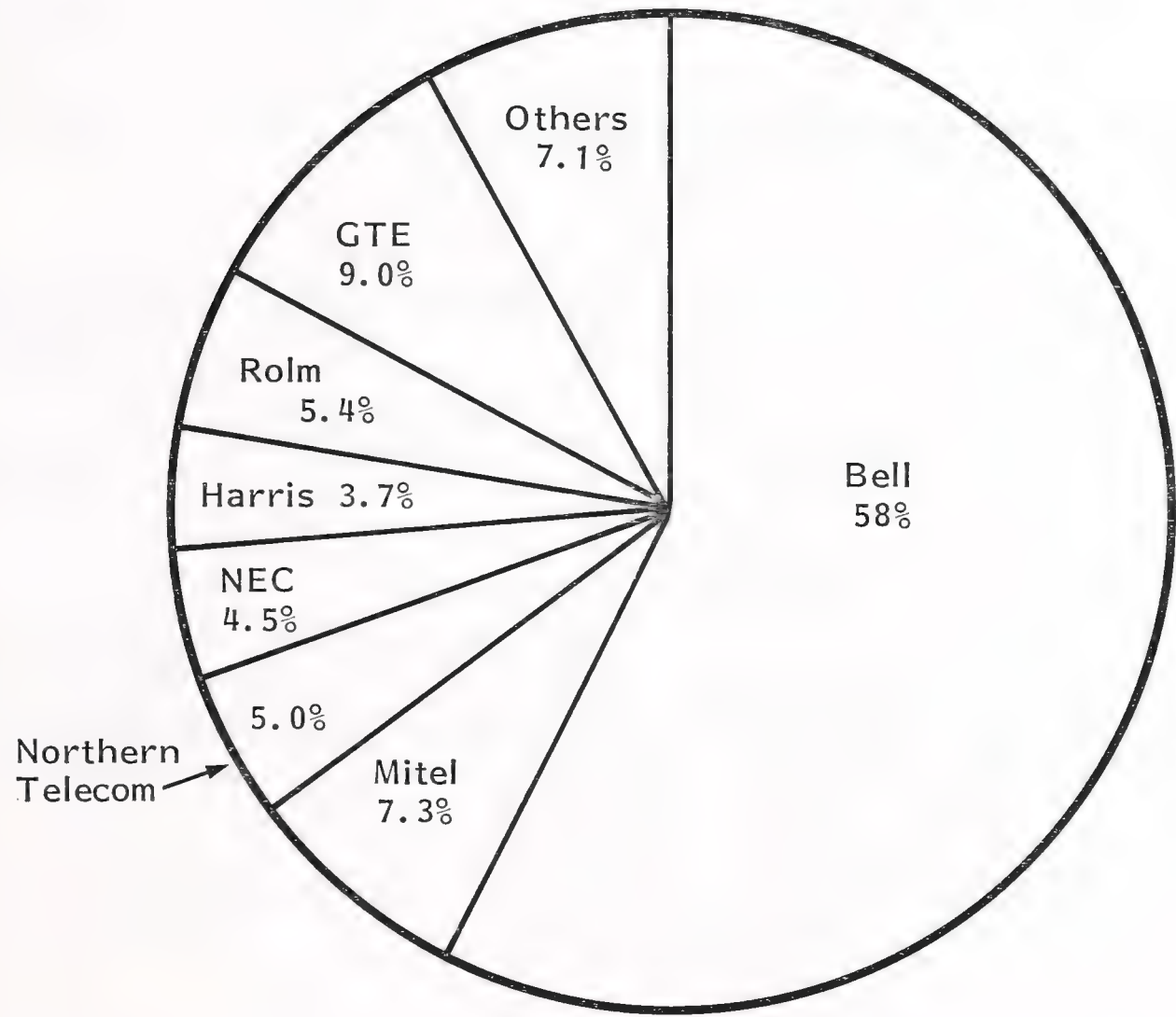
A. CONCLUSIONS

- The PBX/ACD market is overcrowded with suppliers.
 - Over 1,500 companies currently manufacture, distribute, refurbish, or sell/lease non-Bell PBX or key telephone systems.
 - Over 1,000 interconnect manufacturers are competing for PBX market share.
 - Competition is in 500 to 999 line systems (55% of Bell's older generation PBXs).
 - A showdown of PBX marketers is imminent, "survival of the fittest."
 - The interconnect share of the market is expected to increase significantly.
- Appraising market share is difficult because of many variables including the method of measurement; i.e., systems, lines, or instruments; type of equipment (digital or analog) or channels of distribution.

- Exhibit II-I indicates current market share as reflected by survey participants and other research.
- Market forces are going through significant change.
 - Legal and regulatory influences exist.
 - Product service life (installed) has decreased from 17 years in 1975 to eight years in 1982.
 - Technology improvements have resulted in digital equipment replacing analog equipment.
 - New depreciation rules will help manufacturers recover costs faster.
 - The struggling U.S. economy has inhibited growth in PBX sales.
- Service is a key factor for survival in the PBX market.
 - Little product differentiation among many competitors focuses potential users on service capability.
 - The importance of service may not be recognized by marketing. Few vendors mention service in ads and product brochures.
 - PBX service is largely dependent on distributors.
 - The demand for service technicians exceeds the supply.
- Card exchange strategies create potential large float/costs for PBX manufacturers.
- Site preparation and installation are expensive elements of PBX/ACD service.

EXHIBIT II-1

ESTIMATED 1982 PBX MARKET SHARE



- ACD is not differentiated from PBX. The service for both is identical.
- It is important to have a strong service image at the point of sale.
 - Both manufacturers and distributors/interconnects admit that monitoring and control of service by manufacturers needs improvement.
 - Service is perceived by vendors to be a necessary evil for selling hardware, with little profit potential.
 - The customer views service as critically important in selecting PBX equipment.
 - Recognition of the importance of service by PBX marketers is needed.
- PBX field service will be influenced by the market.
 - Longer warranty periods are to be expected because of more reliable equipment. Sales may use longer warranties to help sell hardware.
 - Maintenance contracts may give way to Time and Materials service because of greater equipment reliability.
 - Based on data from North American Telephone Association (NATA), PBX maintenance revenues (including adds, moves, and changes) are expected to grow at a rate of 47% between 1982 and 1984, exceeding new hardware sales, as shown in Exhibit II-2.
- Pricing for PBXs is expected to decline on an equivalent function basis. Greater volumes will be produced and improved technology will offer more functions.

EXHIBIT II-2

PBX PROJECTED MARKET GROWTH

FACTOR	1982	1983	1984
Number of Systems	11,444	13,160	15,130
New Sales (\$ thousands)	\$1,151,500	\$1,324,200	\$1,566,400
Maintenance and AMC* (\$ thousands)	\$ 567,200	\$ 652,200	\$ 843,400
Total Revenues (\$ thousands)	\$1,718,700	\$1,976,400	\$2,409,800

* Adds, Moves, Changes
Source: NATA

- Pricing for PBX service is at present cumbersome.
 - An average per unit price of \$3.50 per instrument requires large volumes to produce meaningful revenues.
 - Pricing by inventory is a tremendous paperwork task.
 - Adds, moves, and changes pricing contributes more to revenue and profit.
- One leading interconnect company indicates that the industry standard for maintenance is:
 - Regular service: 10% gross margin.
 - Adds, moves, and changes: 40% gross margin.
 - Sales/marketing dictate the prices.
- This company believes that at the end of the 1980s they will earn more revenue from service than from hardware.
- Service has business potential:
 - One respondent stated, "within the next ten years service has to drastically change. The major problem is that service has not really been a money making activity. Management has been very marketing oriented in a competitive market. Very little emphasis has been placed on service. Service is seen as an evil necessity, not designed to create income. The interconnect firm will be the key to profitable service in the future."

B. RECOMMENDATIONS

- Rockwell should increase its control over distributors that execute Rockwell maintenance responsibilities.
 - Identify early, and avert, service problems created by distributors.
 - A published example, in February 1982, involved Rolm and Evans & Sutherland. Evans and Sutherland had a major service problem but were expected to solve it with local Rolm distributors.
 - Rolm headquarters ultimately became involved but could have prevented the problem with better communication with distributor and customer.
 - Establish communications and reporting procedures with distributors. Require distributors to submit copies of service call reports to Rockwell.
 - Initiate escalation procedures so that a customer problem which is unsolved after six hours is made known to Rockwell management whether the servicer is a distributor or Rockwell.
 - Provide education and training enhancements by offering distributor courses and updates on a regular basis.
 - Consider central dispatch where customers would call Rockwell who would then contact the distributor for disposition. The distributor would then report the outcome to Rockwell.

- Rockwell should keep working to enhance its service image. Create customer confidence by providing good service whether performed by distributors or Rockwell.
- It should investigate new pricing schemes based on systems or sites.
- Rockwell should also explore cost reduction programs.
 - Rockwell may be providing more preventive maintenance than is required or expected.
 - Consider a combination of preventive maintenance with remedial maintenance.
 - Explore customer self-diagnostic procedures.
 - Ensure that parts float does not get out of hand. Studies show that decentralized repair centers can help reduce float.
 - Investigate new methods of wiring to reduce a major component of installation costs.
- Rockwell should focus on field service as a revenue and profit contributor. It should:
 - Promote engineering services, including site consulting services, to increase revenue.
 - Consider performance (up-time) contracts; they can be marketed effectively and can distinguish Rockwell as a service leader. INPUT believes that Rockwell could offer a 99% up-time guarantee with no increase in cost.

- Provide on-site spares to add to customer confidence and Rockwell revenue.
 - Continually develop and present internal and external promotional programs.
 - Expand and improve knowledge of marketing and marketing methods.
- Finally, INPUT believes that Rockwell would benefit substantially from a study of user service expectations in the PBX marketplace.
 - Knowledge of user perceived requirements could accelerate Rockwell's penetration into the PBX market.
 - Other competitors may not be sensitive to user maintenance expectations.

III FINDINGS

III FINDINGS

A. MARKET CHARACTERISTICS

- A brief market synopsis includes:
 - The Carterfone case, which opened the market initially.
 - Bell's strategy: to retire or replace 80% of old PBXs by 1984.
 - Other companies which are poised and ready to participate in the market.
 - New products that are aimed at:
 - Voice/data integration.
 - Office automation.
 - Digital devices.
 - Mitel's early success resulting from its awareness of and activity in a major portion of the market: small systems.
 - The average PBX size is 67 lines.

- Fifty percent of the total market is under 100 lines.
 - Mitel priced at 10% to 50% below competition.
- The purchase alternative which opened up a new market previously monopolized by leasing arrangements.
- PBX products are marketed and serviced four ways:
 - Directly, via vendors' sales force.
 - By interconnect/distributors.
 - By telcos.
 - By supply houses.
- Most (over 90%) of PBX service is rendered by distributors and interconnects.
- Manufacturers and interconnects offer backup support.
- Market share statistics vary significantly.
 - The market is dynamic and overcrowded with vendors.
 - Different definitions of PBX market share account for the wide variation:
 - Lines.
 - Systems.

- Type (e.g., digital, analog).
 - Channels of distribution.
- Market share feedback from respondents was diluted by lack of familiarity with market share: a significant competitive weakness.
- Market data, therefore, is conditional, based upon:
 - NATA data.
 - INPUT's survey and experience.
 - Secondary research.
- Exhibit III-1 is a list of PBX and ACD vendors as presented in recently published buyer's guides for telecommunication equipment.
- Market share statistics, shown in Exhibit III-2, reflect respondents' estimates of their share of the market.
 - More important than the current market share estimates is the trend for interconnects to gain market share, while Bell loses its market share.
 - It is difficult to believe that Bell will continue to allow the erosion to take place.
 - With regulatory issues close to solution in the courtroom, the AT&T giant could, through its reorganization and restructuring, inhibit new marketers in PBX and ACD.
- Statistics drawn from NATA indicate a healthier growth in service related revenues than in hardware sales, as was shown in Chapter II, Exhibit II-2.

EXHIBIT III-1

PBX AND ACD VENDORS

American Telecom (P)	North Supply (P)
Amtel (A)	*Northern Telecom (A,P)
*Anaconda-Ericsson (P)	OKI (P)
Anderson Jacobsen (P)	Omnitel (P)
Automation Sales (A)	Page (P)
BBL (A)	Phone Craft (A,P)
Bell (A,P)	Porta Systems (A,P)
*CP National (A,P)	Redcom (A,P)
C-Five (A)	Ring (A)
Centel (A,P)	Rockwell (A,P)
*Data Plus (A)	*Rolm (A,P)
*Datapoint (A,P)	Rotelcom (A)
Fisk (A,P)	Siemens (A,P)
General Dynamics (P)	Solid State (P)
GTE (P)	SP Communications (P)
*Harris (A,P)	*Stromberg-Carlson (A,P)
Hitachi (P)	*Telephone Equipment (A)
Homaco (A)	Telephone Industries (P)
*Illinois Bell (P)	*Telesciences (P)
*Infotron (P)	Teletone (P)
*Intecom (P)	TIE (P)
Intelligent Business Systems (P)	*Tone Commander (P)
Lexor (P)	United Systems (A)
Lynch (A)	Valcom (P)
*Melco (P)	Wang (P)
Midwec (P)	*Womack (P)
*Mitel (P)	ZBK (P)
*NEC (P)	

P = PBX, A = ACD

* Interviewed

EXHIBIT III-2

PBX MARKET 1982

RESPONDENT	NUMBER OF SYSTEMS	PERCENT OF MARKET
Bell	107,000	58%
Independents	18,500	10
Interconnects	59,500	32
Total	185,000	100%

- Exhibits III-3 through III-18 reflect market characteristics of respondent firms.

B. SERVICE RESOURCES

- The majority of PBX competitors maintain from two to ten field office locations, as shown in Exhibit III-19.
 - This small number of field offices reflects the fact that PBX firms rely on distributors for primary service. The PBX firm offices provide backup support.
- Statistics for field engineers in total, by office location and per site, are shown in Exhibits III-20 through III-22.
- PBX vendors' field service organizations are lean but have the required resources to support their own or distributor requirements.
 - Software expertise is either direct, within field service, or indirect, via engineering.
 - One firm mentioned that software help from headquarters was "a bit of a hassle."
 - There are, at any given time, 15 to 20 critical requests and 20 to 30 routine requests for software assistance.
 - Specialists and technical analysts are scarce for hardware and software repair work.

EXHIBIT III-3

MARKET CHARACTERISTICS: ANACONDA-ERICSSON

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
ASB 101	44	12	DK
ASB 102	108	24	
ASB 900	960	136	
Prodigy	512 Ports		New

Comments:

- Prodigy is Anaconda-Ericsson's "thrust of the future."
- No ACD.

DK = Don't know

EXHIBIT III-4

MARKET CHARACTERISTICS: CP NATIONAL

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
NEAX 12A	360	48	"\$12 million"
NEAX 22VS	720	144	
NEAX 22SA	1,600	332	
NEAX 22	12,000	1,920	
<u>Comments:</u>			
<ul style="list-style-type: none">● CP National is distributor for NEC Telephones equipment.● ACD is an option.			

EXHIBIT III-5

MARKET CHARACTERISTICS: DATA PLUS

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
PLT	ACD	-	DK
<u>Comments:</u> <ul style="list-style-type: none">• Data Plus sells and services through distributors.			

DK = Don't know

EXHIBIT III-6

MARKET CHARACTERISTICS: DATAPOINT

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
ISX	Up to 20,000 ports		1 (Sept.)
<u>Comments:</u> <ul style="list-style-type: none">● ACD is included in ISX.			

EXHIBIT III-7

MARKET CHARACTERISTICS: HARRIS

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
D1201	536 lines and trunks		Over 7,000
D1202	1,000 lines and trunks		
D1203	120	24	
D1204	900 lines and trunks		
D1205	400 lines and trunks		
Proto Call DLS-1	55	12	
Inn Com DLS-1	55	12	
Proto Call DLS-10	110	20	
<u>Comments:</u>			
● ACD is a software option to D1200. Less than 50 installed			

EXHIBIT III-8

MARKET CHARACTERISTICS: ILLINOIS BELL

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
Dimension 100	100	22	State of Illinois Only
Dimension 400	436	64	
Dimension 600	1,084	184	
Dimension 2000	6,000	840	
<u>Comments:</u> <ul style="list-style-type: none">● Lease only.● ACD is an option.			

EXHIBIT III-9

MARKET CHARACTERISTICS: INFOTRON

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
Dataswitch 4000	Up to 4,000 I/Os		DK
<u>Comments:</u> <ul style="list-style-type: none">● No ACD			

DK = Don't know

EXHIBIT III-10

MARKET CHARACTERISTICS: INTECOM

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
IBX Series 40	400-4,500 ports		12

Comments:

- Intecom thinks they will eventually have over 50% of third generation large systems market. New product: Word Processing InteNet Pocket Controller (WPIPC) allows Wang, IBM, and Lanier business machines to communicate with each other. Due first half of 1983.
- No ACD.

EXHIBIT III-11

MARKET CHARACTERISTICS: MELCO

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
Max 824	8 lines 24 stations		4,000-5,000
<u>Comments:</u> <ul style="list-style-type: none">● Switch converts small business system to a hotel/motel system. Five year warranty.● No ACD.			

EXHIBIT III-12

MARKET CHARACTERISTICS: MITEL

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
SX-5	6	2	100
SX-10	16	8	300
Super 10	16	8	700
SX-20	72 or 48	8 or 12	4,000
SX-100	112 lines and trunks		2,400
SX-200	208 lines and trunks		<u>6,000</u>
			13,500
<u>Comments:</u> <ul style="list-style-type: none"> ● SX 2000 coming in 1983 and will be sold and serviced by Mitel. ● 150-10,000 lines or 32 channels. ● Standalone workstations, electronic mail, diary, word processing. ● IBM link. ● No ACD. 			

EXHIBIT III-13

MARKET CHARACTERISTICS: NEC TELEPHONES

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
NEAX 12A	360	48	6,000
NEAX 22VS	720	144	
NEAX 22SA	1,600	332	
NEAX 22	12,000	1,920	
<u>Comments:</u> <ul style="list-style-type: none">● Self diagnostics and remote maintenance features.● No ACD.			

EXHIBIT III-14

MARKET CHARACTERISTICS: NORTHERN TELECOM

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
SL-IA	80-400	Up to 200	8,000
SLI-LE	400-800	Up to 400	
SLI-VLE	800-2,500	Up to 1,250	
LS-IXL	2,000-5,000	Up to 2,500	
SL-100	Up to 30,000	Up to 1,500	

Comments:

- ACD is an option. Northern-Telecom markets directly and also has a distributor network.
- Northern-Telecom believes they have 15%-16% of the digital PBX market.
- New SL-1 option: call/park feature, ACD options, message center.

EXHIBIT III-15

MARKET CHARACTERISTICS: ROLM

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
VSCBX	144	40	10,000
SCBX	208	52	
CBX	800	120	
LCBX	1,500	224	
VLCBX	4,000	1,200	
ACD			1,200
<u>Comments:</u> <ul style="list-style-type: none"> ● VLCBX is Rolm's newest product. ● ACD is an option. ● Claims to have 12% of ACD market. 			

EXHIBIT III-16

MARKET CHARACTERISTICS:
STROMBERG-CARLSON

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
System Sentry DBX	96-5,376 ports		600,000 lines
<u>Comments:</u> <ul style="list-style-type: none">● ACD is an option.			

EXHIBIT III-17

MARKET CHARACTERISTICS: TELESCIENCES

MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
X 80PBX	480 ports (360 lines, 60 trunks, 60 ports for housekeeping)		18
200			
400			

Comments:

- Beginning stages. Product introduced at last year's ICA show.
- ACD is the same switch as X80PBX and is activated or deactivated by software.
- Same hardware and cabinet.

EXHIBIT III-18

MARKET CHARACTERISTICS: TONE COMMANDER

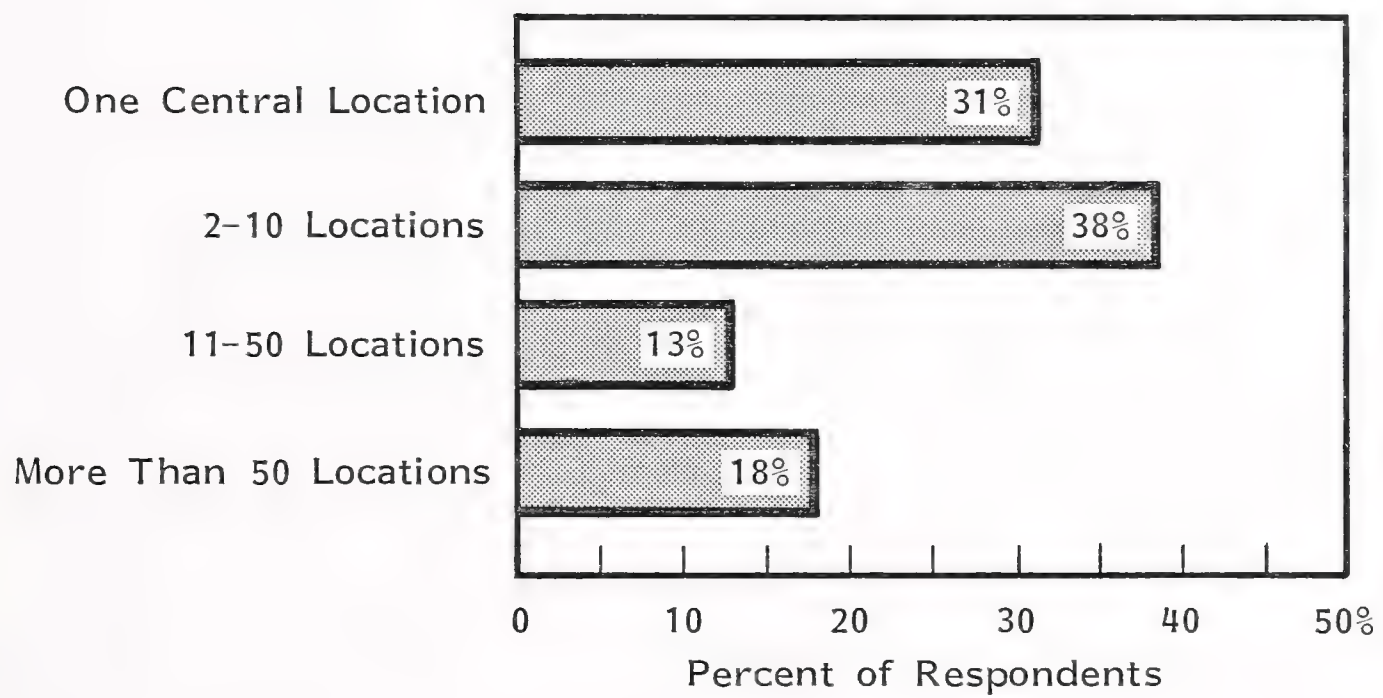
MODELS	SIZES		NUMBER INSTALLED
	LINES	TRUNKS	
MH 4000	6 trunk/65 station		300-400
Simplex 120	120 lines		

Comments:

- Advertizes that Simplex 120 can be installed in a few hours and in half the space of comparable systems.

EXHIBIT III-19

FIELD SUPPORT OFFICE LOCATIONS



Based on 16 Respondents

EXHIBIT III-20

NUMBER OF FIELD ENGINEERS

PROPORTION	IN EACH OFFICE	TOTAL
Range	1-30	4-2,000
Average	8	315
Median	3	32

EXHIBIT III-21

FIELD ENGINEERS PER SITE

Range: One per site to one per 700 sites.

Average: One per 285 sites.

Median: One per 18 sites.

EXHIBIT III-22

FIELD ENGINEERS: RESOURCES

COMPANY	OFFICE LOCATIONS	FIELD SERVICE STAFFING		
		EACH OFFICE	TOTAL	PER SITE
1	13	2	26	DK
2	8	3-5	34	0.14
3	4	3-4	15	DK
4	4	2-3	10	0.0014
5	100	20	2,000	0.001
6	2+	5-10	25	DK
7	1	Prop.	Prop.	Prop.
8	9	3	3	DK
9	8	4	32	0.002
10	200	1	200	DK
11	15	25-30	420	0.4
12	49	8-12	550	0.06
13	20	Prop.	Prop.	Prop.
14	10	DK	DK	DK
15	1	DK	DK	DK
16	1	4	4	1.0
17	4	1	4	DK
18	100	10-12	1,100	0.004

DK = Don't Know, because service handled by distributor.

Prop. = Proprietary information

Only one respondent guessed at the number of field engineers per port.

$10/1,750,000 = 0.000005$

- o Field service organizations are given direction by (report to) operations groups, primarily, a few report directly to marketing and, in rare instances, to manufacturing and engineering functions.
- o Most first line service is performed by distributors.
 - Only two respondents indicated no use of distributors.
 - . Datapoint.
 - . Intecom.
 - Bell uses distributors less than 1% of the time.
 - Mitel markets and services through distributors, but sells and services directly to:
 - . U.S. Government.
 - . Bell.
 - . RCA.
 - Mitel will also directly sell and service the SX2000.
- o The principal rationale for using distributors is to reach the market.
- o All PBX vendors use subcontractors to some extent, for installations.

C. SERVICE OFFERINGS AND PRICING

- Basic maintenance agreements commonly provide for:
 - Twenty-four-hour per day, seven-day per week coverage.
 - Two-hour response time.
 - Parts and labor included.
 - Hardware and software.
- Separate agreements include:
 - Installation.
 - Time and materials (T&M).
 - T&M is usually a small amount of total service (5-10%).
 - Typical rate is \$300/day and travel.
 - Supplementary services.
 - Adds.
 - Moves.
 - Changes.
- Service for PBX and ACD is identical in terms of coverages and content.

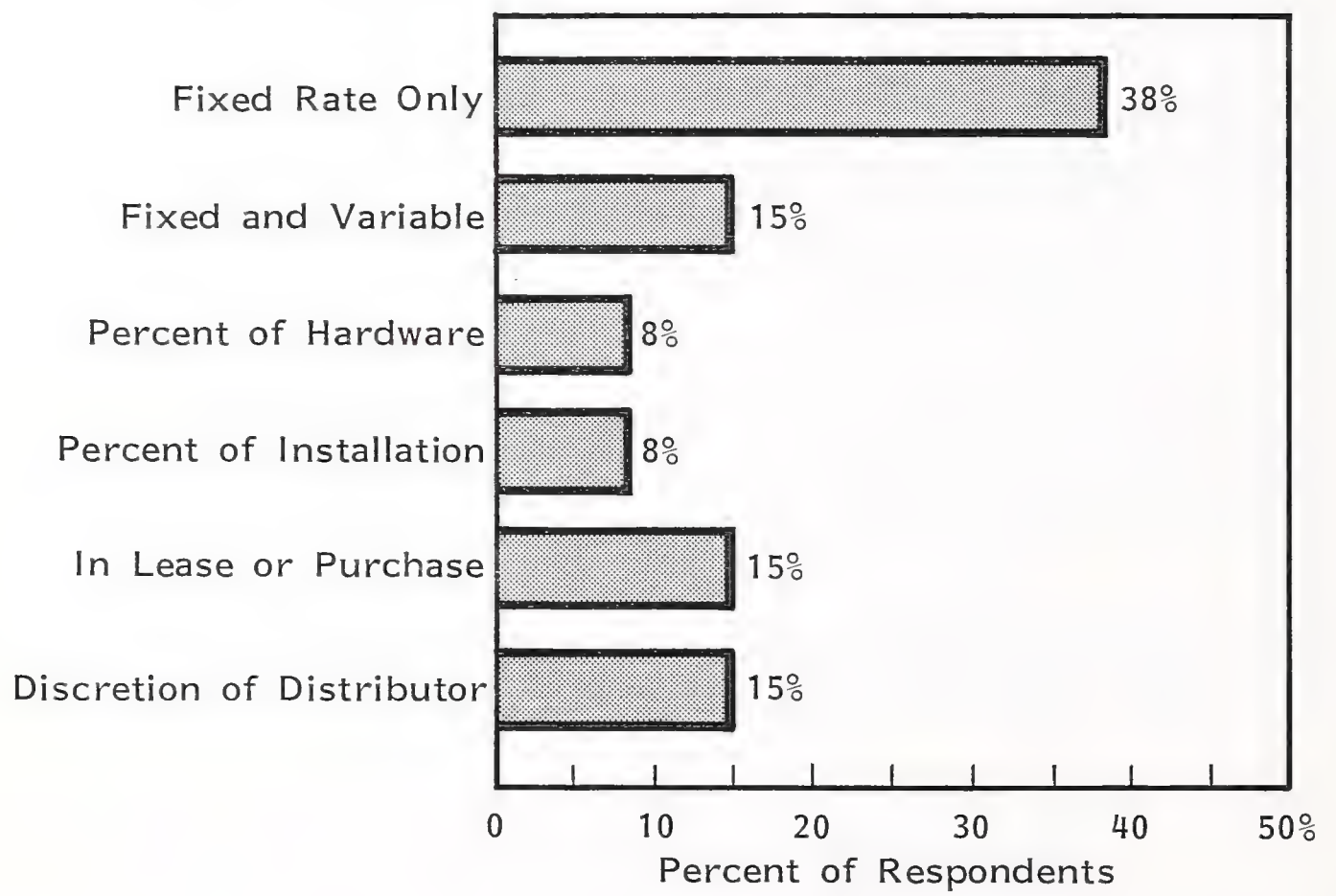
- Software support is provided by all service organizations.
 - Most distributors include it in their service agreements.
 - One vendor incorporates software support in each separate licensing agreement.
 - Software is commonly integrated into hardware so that the repair is made by card replacement.
- Only one vendor provides maintenance for other vendor's products.
 - They inherited the equipment in an acquisition. They are not anxious to expand it.
- Preventive maintenance (PM) is sparse.
 - Half of the firms questioned said that no PM was provided.
 - The other half said "very little" PM was provided and included such minor efforts as changing filters and fans once per month, and changing batteries, requiring only "two hours every three months."
 - PM is often avoided by both users and vendors. Users dislike interrupting an operable system and vendors dislike the extra cost involved.
- Definitions for special service comprise:
 - Emergency service.
 - Any out of service units and "as per customer," i.e., down to the last spare.

- System outage or any major portion thereof.
- Supplementary service.
 - Adds, moves, and changes (AMC).
 - Upgrading.
- Variations in service offerings are differentiated by:
 - Response time:
 - A few provide four- or eight-hour response time as normal, with two hour response for "emergency". One respondent charges a 20% premium for two hour response.
 - Service:
 - One distributor bundles changes into fixed maintenance contracts.
 - Another large vendor includes automatic remote maintenance and testing.
 - Spares on-site option is available.
 - There are on-site service engineer options for very large sites.
- Service functions performed by PBX manufacturers and distributors include:
 - Diagnostics.
 - Remote testing.

- Board replacement.
 - Unit swap.
 - Parts supply.
 - On-site service organization.
 - Installation.
 - Building wiring.
 - User training.
 - Equipment moves.
 - Performance guarantee (for government contracts).
 - System design and consultation.
- Distributors believe they perform more customer service than is recognized by the manufacturers they represent.
 - Many telecommunications manufacturers view service as a routine function, without any significant revenue or profit potential.
 - Distributors, on the other hand, are beginning to recognize and exploit the service function as a separate profit entity.
 - The predominant method of pricing service is based on a fixed rate, as shown in Exhibit III-23.

EXHIBIT III-23

HOW SERVICE OFFERINGS ARE PRICED



Based on 13 Respondents

- One firm provides free service for the life of the product.
 - The cost is built into the hardware price.
 - Installation has a package charge of \$300 daily (\$450 weekend day).
- Another vendor front loads charges on the first installation.
 - It wants to develop a better pricing scheme to get away from massive paper work in pricing per instrument.
 - It is thinking in terms of a fixed price per system.
- "Prices are established by distributors - it's up to them, the dollar is worth one thing in New York City and another in Fort Wayne," cites one vendor.
- The first year's maintenance is almost always bundled into the first year's hardware purchase or lease prices.
- Pricing profiles for Datapoint, Rolm, and Northern Telecom are included as Exhibits III-24, III-25, and III-26, respectively.

D. LOGISTICS MANAGEMENT AND MARKETING

- Site preparation surveys are conducted from one to six months prior to shipment. Larger sites are exceptional.
- Site preparation requirements are extremely varied because of building locations, age, design, etc.
- "Guesstimates" by vendors for site preparation effort include:

EXHIBIT III-24

PRICING PROFILE: DATAPOINT

DATAPOINT PRICING:					
EQUIPMENT	DATAPOINT MODEL (ACD)	PURCHASE PRICE	MONTHLY		INSTALLATION
			ONE-YEAR LEASE	MAINTENANCE	
Small	4901	\$ 42,675	\$ 1,630	\$ 348	\$1,240
Medium	4924	106,630	4,070	578	2,520
Large	4948	273,765	10,450	1,179	5,190
NOTES:					
1. 1% of total system purchase price must be added to installation charge for installation and training support.					
2. No monthly maintenance for instruments but customers are required to buy 10% spares.					
3. Relationships: Installation to purchase price = 1.9% to 2.9%. Twelve months maintenance to purchase price = 5.2% to 9.8%.					
ZONE PRICING:					
ZONE	DISTANCE (miles from service center)		REMOTE SERVICE PREMIUM		
A	0 - 75		N/C		
B	76 - 125		30%		
C	126 - 175		40%		
D	176 - 225		50%		
E	226 or greater		60%		

EXHIBIT III-24 (Cont.)

PRICING PROFILE: DATAPoint

HOURLY RATES:	LOCAL ZONE	REMOTE ZONE
<u>Extra Scope</u>		
Normal		
Rate	\$55	\$65
Minimum Hours	3	3
Overtime		
Rate	65	75
Minimum Hours	3	3
Sundays and Holidays		
Rate	70	80
Minimum Hours	4	4
<u>T & M</u>		
Normal		
Rate	\$65	\$75
Minimum Hours	3	3
Overtime		
Rate	100	110
Minimum Hours	3	4
Sundays and Holidays		
Rate	125	135
Minimum Hours	4	5

EXHIBIT III-24 (Cont.)

PRICING PROFILE: DATAPOINT

COVERAGE PLANS:						
DAY	BASIC	ALT. SHIFT	INFO. SWITCH	16 HOUR	24 HOUR	HOLIDAY
Monday-Friday	--	10%	12%	15%	35%	5%
Monday-Saturday	15%	25	27	30	50	5
Monday-Sunday	35	45	47	50	70	5
RESPONSE TIME OPTIONS AND PREMIUMS:						
RESPONSE TIME OPTION				PRIORITY RESPONSE PREMIUM		
Normal				N/C		
Four Hour Response				12.5%		
Two Hour Response				20.0%		

EXHIBIT III-25

PRICING PROFILE: ROLM

CONTRACT MAINTENANCE:		
SERVICE	SITE A	SITE B
Lines	128	168
Trunks	24	24
Consoles	1	1
Options:		
Forward Busy/	→	Dime/Rotary Conversion
Do Not Disturb		
Toll Restriction		
Instruments		
Single Line	70	125
Six Button	20	21
Ten Button		4
ETS-100	1	
KSU5:Line Cords 85		KSU:9 Line Cords: 15.7
Other Sets	1	1920 Button Sets
Speakerphones	2	3
Quarterly Price	\$1,000.95	\$1,465.59
Monthly Price	333.65	488.53
Software Reconfiguration Charges: \$575		
T & M rates: \$36/hr. for normal work hours		
\$54/hr. for outside normal work hours		
\$72/hr. for Sundays and Holidays		
Note: These two examples show a streamlined approach to pricing: Prices are per site per calendar quarter.		

EXHIBIT III-26

PRICING PROFILE: NORTHERN TELECOM

- Northern Telecom prices PBX service by basic instruments.
 - Instruments include a combination of phone sets, consoles, lines, and trunks.
 - Added features, which increase the maintenance costs to users, include for example:
 - . Key Systems
 - . Intercom
 - . Paging
 - . ACD
 - . Microwave Transmission
- A general "Rule of Thumb" for Northern Telecom maintenance is:
 - \$2.70 per month per instrument.
 - Fully loaded systems, incorporating numerous options, cost \$5.00 per month per station.
 - Prices are not contingent upon number of buttons.
 - . Northern Telecom found the bookkeeping to be extraordinary.
- Northern is currently exploring streamlined ways of pricing service, such as by site.
- On-site (resident) services are "several thousand dollars" per year."
- T&M hourly rates vary by geographic location.
 - The overall, current average rate is \$37 per hour with a \$100 minimum charge.

- Four to five visits.
- One week per 500 ports.
- A "small" site preparation job is one and one-half days.
- Site preparation costs are bundled into hardware price.
- Some firms charge separately for site preparation and then bundle into bid price.
- Fifty to 90% of installation time and effort is station cabling.
- Many variables affect installation times.
- The length of installation effort varies from a few hours to several months including wiring.
- After wiring is complete:
 - One respondent installs a large PBX in six hours, a small PBX in four hours.
 - Another requires 40 man hours per 250-300 lines.
- A very large recent installation involved 159 buildings and 200 miles of cabling, and took two years to complete.
- Another large installation was completed in September, 1982.
- On-site, during cut over, there were:

- . Eight service engineers.
 - . Two trouble desks.
 - . Four marketing people.
- "There are bound to be problems in nine months of wiring," according to an informed installation manager.
- Pricing for installation is determined during the site survey or site preparation phase.
 - These charges are factored into total bid prices for hardware.
 - One major PBX vendor is thinking about charging ongoing maintenance at a fixed percentage rate of the installation price or cost.
 - . This does not seem to be a prudent way to price maintenance.
 - . There is little correlation between installation effort and ongoing service.
- Exhibit III-27 summarizes the elapsed time after receipt of the order to: shipment, site preparation and installation of equipment.
- There are very few standard cable lengths. Examples reported included:
 - One hundred-fifty feet to switch.
 - Station to block:
 - . Seven feet.

EXHIBIT III-27

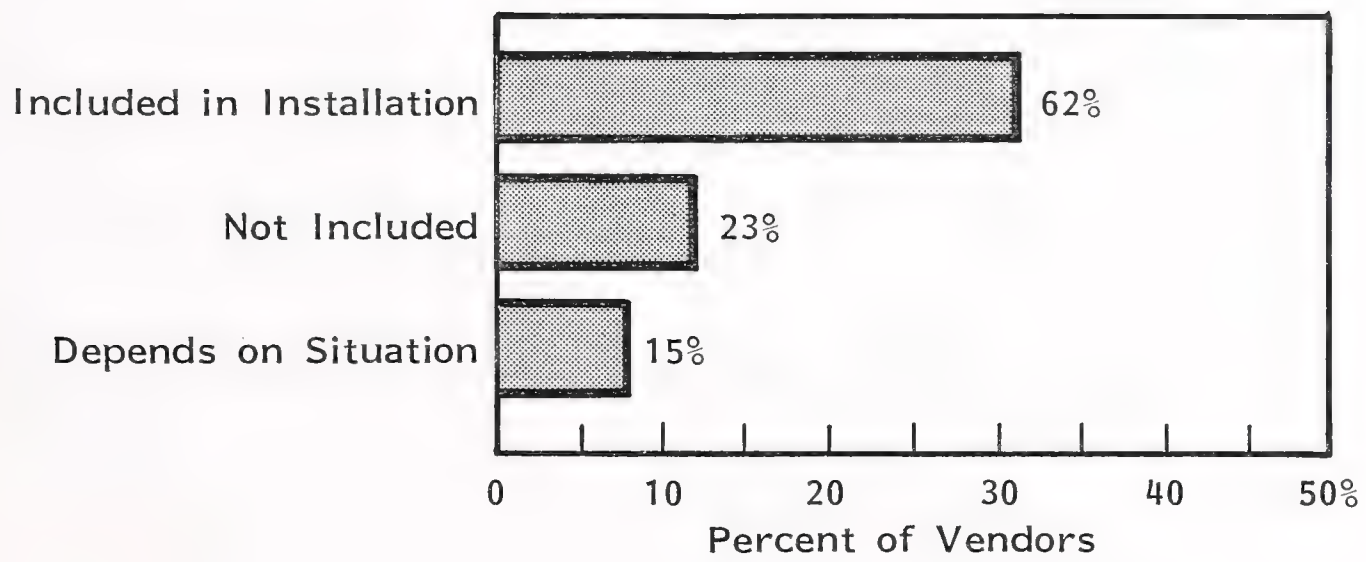
ELAPSED CALENDAR DAYS
AFTER RECEIPT OF ORDER

PROPORTION	FOR EQUIPMENT TO BE SHIPPED TO SITE (Days)		FOR SITE PREPARATION AND INSTALLATION (Days)	
	LARGE SYSTEM	SMALL SYSTEM	LARGE SYSTEM	SMALL SYSTEM
Range	90-360	30-60	60-240	30-120
Average	184	50	173	70
Median	120	45	180	60

- . Fourteen feet.
 - . Twenty-five feet.
- The cost of cabling is generally included in the price of hardware installation, as shown in Exhibit III-28.
- Extra charges for union labor, teflon, and nonstandard lengths are also priced into hardware installation.
- One firm states: "We're close to adopting teflon as a standard. It is de facto standard now."
- PBX full service (diagnostics and parts exchanges) warranty starts from the date of delivery or shipment and ranges from 30 days to 10 years. The 10-year warranty means that service will be available for 10 years, at a price.
 - The average warranty is two years.
- The warranty clock starts from the date of purchase by the distributor or date of installation/cut over.
- Software is included in the warranty.
- Warranty exclusions include:
 - Abuse.
 - Other vendors' devices.
 - User caused damages.
 - Force majeure.

EXHIBIT III-28

COST OF CABLING



Based on 13 Respondents

- Extended warranties, other than maintenance contracts, are not commonly offered.
- Ninety-two percent of PBX repair centers are centralized; e.g, they exist in one depot.
 - These are supplemented by field service offices which stock some parts.
 - Most "repair centers" are actually parts depots and exchange good parts for bad and act as a clearing house between field and actual factory repair.
- All central repair centers handle both warranty and post warranty repairs.
- Repairs are priced into warranty and maintenance contracts.
 - There is usually a fixed repair rate by the manufacturer to the distributor.
 - Sometimes repairs are priced at fixed rates to end users.
- Repair center turnaround times vary:
 - They range from one to 30 days.
 - The average is eight days.
 - The median turnaround time is two days.
- Ninety-three percent of service firms have parts exchange programs with distributors.

- The distributor obtains a Material Return Authorization (MRA) number from the vendor.
- The vendor ships the new part and receives the old one.
- If the old part is not received in 30 to 60 days, the distributor is billed for the new part at list price.
- Discounts for parts are not available to third party suppliers.
- Sparing levels are based on statistics, matrices, models, and recommendations, including:
 - Failure rates.
 - Density of sites.
 - Proximity to sites.
 - Usage rates.
 - No convenient algorithms or logic for sparing levels were discovered in this research.
- Critical parts include power supplies, consoles, line and trunk cards.
- Some sparing levels are determined by contract.
 - Bell system spares are established by tariff.
 - Recommended spares from one firm are legally incorporated into a clause of the distributor agreement. That is, the distributor must maintain minimum spares levels.

- Spare parts depots are colocated with central and field offices, plus a few customer sites.
 - Very few customer sites have spares.
 - Only when there are 2,000 lines or more or when the customer pays.
 - "It's not profitable for a user to store spares. A line card lasts for ten years," according to one customer.
- Most (95-100%) spares are supplied by the vendor.
- Prices are established for spare parts and are available within 48 hours to six months for noncontract customers.
- Parts are included in most maintenance contracts.
- Maintenance for power supplies, power line conditioners, and diesel generators is generally not provided by PBX firms.
 - PBX vendors help solve power supply problems but rely on power supply service groups for the actual service work.
- Battery backup may be provided through the service firm, either at an extra charge, or included in maintenance service.
 - The service firm will help the customer find a service resource.
 - One firm does include it in its service package and when service is needed it calls the manufacturer.
 - Another firm is investigating the use of Topaz, a firm specializing in power supplies, for all its power related maintenance.

APPENDIX A: QUESTIONNAIRE

000013

SURVEY QUESTIONNAIRE - INTERCONNECT MARKET

I. MARKET CHARACTERISTICS

I. Please identify your firm's product lines for PBX and ACD systems.

a. PBX Systems

<u>Size</u>	<u>Model Number</u>	<u>Number Installed</u>	<u>Market Share*</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

b. ACD Systems

<u>Size</u>	<u>Model Number</u>	<u>Number Installed</u>	<u>Market Share*</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

*Estimated in terms of U.S. Market, by sales dollar volume, annual.

2. Which of each type of system is considered to be the largest, smallest and the most typical?

	<u>Largest</u>	<u>Smallest</u>	<u>Typical</u>
PBX Model No.			
ACD Model No.			

3. What new products are anticipated?

<u>Size</u>	<u>Model Number</u>	<u>PBX</u>	<u>ACD</u>	<u>When Available</u>
		()	()	
		()	()	
		()	()	
		()	()	

II. RESOURCES

4. Where are your field support offices located?

5. How many field engineers are there:
- a. In each office? _____
 - b. In total? _____
6. What is the ratio of field engineers:
- a. To each customer site? _____
 - b. To number of connected parts? _____

7. Please briefly describe other field service personnel:

FIELD SERVICE					
<u>FIELD OPERATIONS</u>	<u>LOGISTICS</u>	<u>TECHNICAL SUPPORT</u>	<u>ADMINISTRATIVE</u>		
No. Managers _____	No. Managers _____	No. Managers _____	No. Managers _____		
No. Field Engrs. _____	No. Repair Techs _____	No. Software Engr. _____	No. Finance _____		
No. Specialists _____	No. Others: _____	No. Others: _____	No. Personnel _____		
No. HQ Personnel _____	_____	_____	No. Others: _____		
No. Software FEs _____	_____	_____	_____		
No. Others: _____	_____	_____	_____		
_____	_____	_____	_____		
_____	_____	_____	_____		
<u>OTHER</u>			<u>OTHER</u>		
_____	_____	_____	_____		
_____	_____	_____	_____		
_____	_____	_____	_____		

8. Do you utilize maintenance services from sources outside your firm?

a.

Distributors Subcontractors

_____	_____
_____	_____
_____	_____
_____	_____

b. Under what circumstances does your firm engage these outside resources?

III. SERVICE OFFERINGS AND PRICES

9a. Please define your company's service offerings.

<u>Contract Type</u>	<u>Description Of Service</u>	<u>Price Or Rate</u>	<u>Response Time</u>
Basic On Call	_____	_____	_____
Emergency*	_____	_____	_____
T & M	_____	_____	_____
Extra Shift	_____	_____	_____
Supplemental Services**	_____	_____	_____
Other	_____	_____	_____
_____	_____	_____	_____

*Please define Emergency outages: _____

**Please define supplemental services: _____

9b. Are these services the same for ACD and PBX? If not, please delineate differences:

9c. Is software support included in maintenance? If not how is it covered?

9d. Does your firm provide maintenance for other vendors' equipment? If so what types and under what circumstances?

9e. How many hours are recommended for Preventive Maintenance, by System?

9f. Would you please send INPUT a copy of your service brochure and copies of your service contracts?

10a. How are your service offerings priced, generally?

Fixed Rate? _____

Fixed Rate and Variable? _____

Percent of hardware value? _____

Other? _____

10b. Is the first year maintenance cost to the customer bundled into the purchase price of his equipment?

11a. How is installation handled?

FACTORS	SITE PREP	INSTALLATION
No. of service visits required?		
No. of hours required?		
What are your standards?		
How is this cost covered? (i.e., included in hardware price, etc.)		

11b. From the time an order is received, approximately how long does it take in elapsed or calendar days for:

	<u>LARGE SYSTEM</u>	<u>MEDIUM SYSTEM</u>	<u>SMALL SYSTEM</u>
1. The equipment to be shipped to the site?	_____	_____	_____
2. For site preparation to be completed?	_____	_____	_____
3. For installation to be completed?	_____	_____	_____

11c. Is cabling included in installation?

() YES () NO

1. What are the charges? _____
2. Is station cabling separate from house/feeder cabling? _____
3. What are standard station cable lengths? _____

11d. Are there any additional charges for options or other parameters such as teflon, union labor, extra lengths, etc?

1. What are the options and charges? _____

12. What is your company's warranty policy?

- a. What is the duration of the warranty and when does it start?

- b. What is included in the warranty?

- c. What is excluded in the warranty?

- d. If software service is not included in the warranty, how is it handled?

- e. Do you have a provision for Extended Warranty and if so, how is it implemented by the customer?

IV LOGISTICS MANAGEMENT AND MARKETING

13. Where are your company's repair centers located?

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

a. What is the nature of the repair work done at these centers?

b. Do repair centers handle warranty as well as post warranty repairs?

c. Are repairs priced separately or included in service/warranty?

What are the charges for repairs?

d. What is the turnaround time for repairs?

e. Does your firm have an exchange program and if so, how is it implemented?

f. Are discounts available to third party suppliers and if so, what are they?

14. What is your firm's policy regarding sparing levels:

- a. Per system/model:
 - Card modules
 - Complete units
 - Piece parts
 - Consumables
 - Other

b. Where are your spares depots located?

c. To what extent are spare parts located on-site?

d. What is the policy of providing spare parts to third parties?

e. What is the general distribution of customer-owned versus vendor-supplied spare parts?

f. What are your firm's prices and availability for spare parts?

g. Are spare parts included in maintenance contracts?

15. What are the service offerings and prices for power supplies offered by your firm?

	<u>Service Includes</u>	<u>Price</u>
a. UPS Systems (including battery maintenance if required).		
b. Power line conditioning hardware		
c. Diesel generator emergency systems		

APPENDIX B: LIST OF RESPONDENTS

APPENDIX B: LIST OF RESPONDENTS

- Anaconda-Ericsson.
- CP National.
- Data Plus.
- Datapoint.
- Harris.
- Illinois Bell.
- Infotron.
- Intecom.
- Melco.
- Mitel.
- NEC.
- Northern Telecom.

- Rolm.
- Stromberg-Carlson.
- Telephone Equipment Corporation.
- Telesciences.
- Tone Commander.
- Womack (Solid State Systems).

APPENDIX C: TITLES OF RESPONDENTS

APPENDIX C: TITLES OF RESPONDENTS

- Manager of Marketing Development.
- Director of Operations.
- President.
- Service Manager.
- Product Line Manager.
- Technical Director.
- Field Support Manager.
- Director of Indirect Sales.
- Senior Customer Service Engineer.
- Regional Director, Field Service.
- Manager Marketing Administration.

APPENDIX D: ROLM MAINTENANCE AGREEMENT

MAINTENANCE AGREEMENT

ROLM, and

("Customer") agree this ____ day of _____, 19____, that ROLM shall provide maintenance services on the equipment set forth on Schedule A attached hereto, which equipment is installed on Customer's premises at _____ (the "Premises"), and Customer shall pay ROLM for such services, all as described in this Agreement.

TERM OF AGREEMENT

This Agreement shall begin _____ day of _____ and shall continue for one year from such date. Thereafter, this Agreement shall be automatically renewed from year to year, unless either party gives the other written notice of termination at least thirty (30) days prior to an annual anniversary date.

PRICE AND PAYMENT TERMS

Customer shall pay to ROLM \$1465.59 _____ per calendar quarter for ROLM's performance of its maintenance obligations under paragraph 1 on the third page of this Agreement. There shall be no increases in maintenance charges on the Equipment described on Schedule A during the first twelve (12) months. Thereafter, maintenance charges on the Equipment shall increase no more than once each twelve (12) month period, and ROLM shall furnish customer at least ninety (90) days prior notice of any such increase. Increases in maintenance charges, exclusive of charges for maintenance on additions, shall be limited to the increase in the Revised Consumer Price Index for Urban Wage Earners and Clerical Workers. Maintenance on additions to the Equipment shall be performed at ROLM's standard rates, and such charges shall be in addition to charges for maintenance performed on the Equipment described on Schedule A. Charges for maintenance on additional equipment shall begin with the first quarterly invoice following installation of the addition.

ADDITIONAL TERMS AND CONDITIONS INCLUDED ON _____ ATTACHED ARE AN INTEGRAL PART OF THIS AGREEMENT.

CUSTOMER

ROLM

BY _____

TITLE _____

DATE _____

EQUIPMENT DESCRIPTION

PRICE

Film CBX defined to include:

Hardware	Working	Equipped For	Wired For
Single Line Extensions	168	168	176
ETS Extensions			
Trunks	24	24	40
Tie Lines	8	8	16
Direct Inward Dial Trunks			
Consoles	1	1	1
Hardware Subtotal			\$ _____

Optional Software Features

Feature

Price

Dime/Rotary Conversion

\$ _____

Optional Software Features Subtotal

\$ _____

Station Equipment	Quantity	Unit Price	Total Price
Single Line Sets	125	\$ _____	\$ _____
5 Line (8 Button) Sets	21	_____	_____
8 Line (10 Button) Sets	4	_____	_____
ETS-100		_____	_____
KSU <u>9</u> ; Line Cards <u>157</u>		_____	_____
Other Sets <u>19 line (20 button) sets</u>	2	_____	_____

Station Equipment Subtotal

\$ _____

Other Equipment/Accessories

4A Speakerphones

3

\$ _____

Other Equipment/Accessories Subtotal

\$ _____

Equipment Total

\$ _____

Taxes

\$ _____

System Installation

\$ _____

Exceptional Items (if any) - _____

\$ _____

System Total

\$ _____

SCHEDULE A CONTINUED ON REVERSE SIDE

1. MAINTENANCE SERVICE OBLIGATIONS OF ROLM

- A. ROLM shall provide such service and repairs as is reasonably necessary to keep the Equipment operating in good order.
- B. ROLM shall respond to normal malfunctions in the Equipment within twenty-four (24) hours after notification, between 9:00 a.m. and 5:00 p.m., Monday through Friday, except any holidays observed by either ROLM or Customer.
- C. ROLM shall respond to major system failures within three (3) hours after notification.

ROLM's maintenance obligations under this paragraph include labor and parts required to repair or replace Equipment which has become defective through normal wear and usage, and does not include additions to, relocation, or removal of equipment, replacement or repairs of parts lost, stolen or damaged other than by causes arising out of ordinary use of the Equipment.

2. ADDITIONS, MOVES AND CHANGES, REMOVAL

ROLM shall, upon Customer's request, provide services required for additions to, moves and changes on, and removal of the Equipment at ROLM's then current charges, which shall be in addition to the maintenance service charges described under price and payment terms on the face of this Agreement.

3. ACCESS TO PREMISES

Customer grants ROLM and agrees to aid ROLM in obtaining full access to the Premises of Customer in connection with ROLM's performance of its obligations under this Agreement.

4. CUSTOMER'S REMEDIES; LIMITATION OF LIABILITY

IN THE EVENT OF ROLM'S MATERIAL BREACH OF THIS AGREEMENT, CUSTOMER MAY CANCEL THIS AGREEMENT. THIS SHALL BE THE SOLE AND EXCLUSIVE REMEDY AVAILABLE TO CUSTOMER, AND ROLM SHALL IN NO EVENT BE LIABLE FOR ANY GENERAL, SPECIAL OR CONSEQUENTIAL DAMAGES FOR LOSS, DAMAGE OR EXPENSE DIRECTLY OR INDIRECTLY ARISING FROM CUSTOMER'S INABILITY TO USE THE EQUIPMENT EITHER SEPARATELY OR IN COMBINATION WITH ANY OTHER EQUIPMENT OR FROM ANY OTHER CAUSE. CUSTOMER AGREES THAT ROLM SHALL NOT BE LIABLE TO CUSTOMER FOR ANY CONSEQUENTIAL DAMAGES.

5. EXCLUSIONS FROM SERVICE

Parts and items of, and additions to the Equipment which have been abused, willfully or accidentally, or have been neglected, or have been damaged by Act of God, or by fire, tampering or negligence or by any other cause other than an ROLM service person, are excluded from this Agreement, and ROLM shall not be responsible therefor. Repairs required as a result of any of the foregoing shall be made by ROLM, upon request from Customer, at ROLM's then current rates.

6. UNCONTROLLABLE CIRCUMSTANCES

If the performance by ROLM of any part of this Agreement is prevented, hindered, delayed or otherwise made impractical by reason of any flood, riot, fire, strike, explosion, war or any other cause beyond the control of ROLM, ROLM shall be excused from such performance to the extent that it is prevented, hindered or delayed by such causes. Upon the occurrence of any such events, ROLM shall use its reasonable efforts to notify Customer of the nature and extent of any such condition.

7. ROLM CORPORATION'S GUARANTEE OF MAINTENANCE AND SPARE PARTS

ROLM is a wholly owned subsidiary of ROLM Corporation. ROLM Corporation guarantees to Customer that ROLM Corporation or its designee will have available maintenance and spare parts for the Equipment for a period of at least ten (10) years from the Date of Cutover of the Equipment at Customer's Premises.

8. GENERAL

This Agreement shall be governed by the laws of the State of New York. Customer may not assign its rights or delegate its obligations under this Agreement without the prior written consent of ROLM. In the event of invalidity of any provision of this Agreement, the parties agree that such invalidity shall not affect the validity of the remaining portions of this Agreement, and ROLM and Customer agree to substitute for the invalid provision a valid provision which most closely approximates the economic effect and intent of the invalid provision. This Agreement represents the entire agreement between ROLM and Customer with respect to the maintenance of the Equipment, and supersedes any prior agreement and negotiations between the parties.

9. UNAUTHORIZED SERVICE

Unauthorized personnel making changes to the system or attempting service voids this contract.

	Unit Price	New	Pricing
STATION EQUIPMENT			
Single line telephone (1)	\$ 75	\$ 100	\$ 70
Five line, Key-ROLM (1)	700	115	80
Nine line, Key-ROLM (1)	770	115	80
Five Line, Key-Conventional (1)	190	155	70
Nine Line, Key-Conventional (1)	250	180	70
100 ETS	320	100	70
Key Service Unit (no power supply interrupter or cover)	325	165	-
KSU line card	40	25	-
KSU manual intercom card	30	25	-
CBX HARDWARE			
16 Channel Coder	650	25	-
16 Channel Decoder	600	25	-
16 Channel ETI Controller	4000	40	-
8 Channel Line card	750	25	-
4 Channel OPX card	600	20/OPX	-
4 Channel Key card	550	25	-
4 Channel Direct Trunk card	950	25/Trunk	-
8 Channel Tie Trunk card (with controller)	2300	40/Tie Trunk	-
8 Channel DID Trunk card (with controller)	3000	40/DID Trunk	-
Attendant Console	4000	100	40
48K Memory card	9250	100	-
12K Memory card	\$ 4000	\$ 100	\$ -
CBX SOFTWARE CHARGES			
Reconfiguration Charges	\$ 575; delivered 30 days from customer definition		
Additional Features	Per quote at the then current feature price list.		

NOTE 1. Price assumes standard building conditions. Additions greater than 5 telephones at any one time or additions that exceed the "wired for capacity" require pricing by quote only.

Normal working hours are 8-5 Monday through Friday; time and materials work will be done at the rate of \$36 per hour; an overtime rate of \$54 per hour will apply after hours and Saturdays. Sundays and holiday work will be charged at a \$72 per hour rate. All rates are quoted portal-to-portal.

EQUIPMENT, ENVIRONMENT AND OTHER SPECIFICATIONS

Those specifications required for operation of the equipment are

PRIMARY POWER	- Per Cabinet (other than VS)	- One dedicated 30 Amp. 208 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit - same phase - (terminated in twistlock outlet)
	- Per VS Cabinet	- One dedicated 20 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in twistlock outlet)
	- Per Console	- One 15 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in duplex outlet)
	- General Use	- One dedicated 20 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in double duplex outlet)
ENVIRONMENT (Operating)		
	- Humidity	- 30% - 60% relative humidity nominal
	- Air Conditioning/Ventilation	- 6826 Btu/hr or 0.569 tons per cabinet (40° to 80° F or 4.4° to 26.7° C), nominal
		- For VSCBX - may require less air conditioning however, must be able to move a minimum of 400 Cubic Feet at 80° F
ROOM SIZE	- Per Cabinet (other than VS)	- 59 in. (W) x 28 in. (D) x 65 in. (H) per cabinet
	- Per VS Cabinet	- VSCBX - 38 in. (W) x 28 in. (D) x 71 in. (H)
	- Per Console	- Plus 36 in. minimum work space surrounding cabinets
WEIGHT	-	- 1000 pounds per cabinet - -
CONDUIT	-	- Per console or telephone - 1/2 in. conduit minimum to equipment room
	-	- Distribution Frames - All distribution frames not located in the telephone equipment room require a conduit or raceway (per local code) of adequate size to feed to the telephone equipment room
OTHER	Floors	- Tile sealed concrete or stained wood
	Walls	- Sealed or painted
	Lighting	- 70 candle foot minimum

MAINTENANCE AGREEMENT

ROLM, and

("Customer") agree this ____ day of _____, 19____, that ROLM shall provide maintenance services on the equipment set forth on Schedule A attached hereto, which equipment is installed on Customer's premises at _____ (the "Premises"), and Customer shall pay ROLM for such services, all as described in this Agreement.

TERM OF AGREEMENT

This Agreement shall begin ____ day of _____ and shall continue for one year from such date. Thereafter, this Agreement shall be automatically renewed from year to year, unless either party gives the other written notice of termination at least thirty (30) days prior to an annual anniversary date.

PRICE AND PAYMENT TERMS

Customer shall pay to ROLM \$1000.95 per calendar quarter for ROLM's performance of its maintenance obligations under paragraph 1 on the third page of this Agreement. There shall be no increases in maintenance charges on the Equipment described on Schedule A during the first twelve (12) months. Thereafter, maintenance charges on the Equipment shall increase no more than once each twelve (12) month period, and ROLM shall furnish customer at least ninety (90) days prior notice of any such increase. Increases in maintenance charges, exclusive of charges for maintenance on additions, shall be limited to the increase in the Revised Consumer Price Index for Urban Wage Earners and Clerical Workers. Maintenance on additions to the Equipment shall be performed at ROLM's standard rates, and such charges shall be in addition to charges for maintenance performed on the Equipment described on Schedule A. Charges for maintenance on additional equipment shall begin with the first quarterly invoice following installation of the addition.

ADDITIONAL TERMS AND CONDITIONS INCLUDED ON _____ ATTACHED ARE AN INTEGRAL PART OF THIS AGREEMENT.

ROLM

E _____

EQUIPMENT DESCRIPTION

PRICE

Film CBX defined to include:

Hardware	Working	Equipped For	Wired For
Single Line Extensions	128	144	144
ETS Extensions			
Trunks	24	24	24
Tie Lines	8	8	16
Direct Inward Dial Trunks			
Consoles	1	1	1
Hardware Subtotal			\$ _____

Optional Software Features

Feature

Price

Advanced Features	\$ _____
Forward Busy/Do Not Disturb	_____
Toll Restriction (op) (3 Digit)	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Optional Software Features Subtotal

\$ _____

Station Equipment	Quantity	Unit Price	Total Price
Single Line Sets	70	\$ _____	\$ _____
5 Line (8 Button) Sets	20	_____	_____
9 Line (10 Button) Sets	_____	_____	_____
ETS-100	1	_____	_____
KSU 5 ; Line Cards 85	_____	_____	_____
Other Sets	1	_____	_____
_____	_____	_____	_____

Station Equipment Subtotal

\$ _____

Other Equipment/Accessories

4A Speakerphones	2	\$ _____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Other Equipment/Accessories Subtotal

\$ _____

Equipment Total

\$ _____

Taxes

\$ _____

System Installation

\$ _____

Exceptional Items (if any) _____

\$ _____

System Total

\$ _____

SCHEDULE A CONTINUED ON REVERSE SIDE

1. MAINTENANCE SERVICE OBLIGATIONS OF ROLM

- A. ROLM shall provide such service and repairs as is reasonably necessary to keep the Equipment operating in good order.
- B. ROLM shall respond to normal malfunctions in the Equipment within twenty-four (24) hours after notification, between 9:00 a.m. and 5:00 p.m., Monday through Friday, except any holidays observed by either ROLM or Customer.
- C. ROLM shall respond to major system failures within three (3) hours after notification.

ROLM's maintenance obligations under this paragraph include labor and parts required to repair or replace Equipment which has become defective through normal wear and usage, and does not include additions to, relocation, or removal of equipment, replacement or repairs of parts lost, stolen or damaged other than by causes arising out of ordinary use of the Equipment.

2. ADDITIONS, MOVES AND CHANGES, REMOVAL

ROLM shall, upon Customer's request, provide services required for additions to, moves and changes on, and removal of the Equipment at ROLM's then current charges, which shall be in addition to the maintenance service charges described under price and payment terms on the face of this Agreement.

3. ACCESS TO PREMISES

Customer grants ROLM and agrees to aid ROLM in obtaining full access to the Premises of Customer in connection with ROLM's performance of its obligations under this Agreement.

4. CUSTOMER'S REMEDIES; LIMITATION OF LIABILITY

IN THE EVENT OF ROLM'S MATERIAL BREACH OF THIS AGREEMENT, CUSTOMER MAY CANCEL THIS AGREEMENT. THIS SHALL BE THE SOLE AND EXCLUSIVE REMEDY AVAILABLE TO CUSTOMER, AND ROLM SHALL IN NO EVENT BE LIABLE FOR ANY GENERAL, SPECIAL OR CONSEQUENTIAL DAMAGES FOR LOSS, DAMAGE OR EXPENSE DIRECTLY OR INDIRECTLY ARISING FROM CUSTOMER'S INABILITY TO USE THE EQUIPMENT EITHER SEPARATELY OR IN COMBINATION WITH ANY OTHER EQUIPMENT OR FROM ANY OTHER CAUSE. CUSTOMER AGREES THAT ROLM SHALL NOT BE LIABLE TO CUSTOMER FOR ANY CONSEQUENTIAL DAMAGES.

5. EXCLUSIONS FROM SERVICE

Parts and items of, and additions to the Equipment which have been abused, willfully or accidentally, or have been neglected, or have been damaged by Act of God, or by fire, tampering or negligence or by any other cause other than an ROLM service person, are excluded from this Agreement, and ROLM shall not be responsible therefor. Repairs required as a result of any of the foregoing shall be made by ROLM, upon request from Customer, at ROLM's then current rates.

6. UNCONTROLLABLE CIRCUMSTANCES

If the performance by ROLM of any part of this Agreement is prevented, hindered, delayed or otherwise made impractical by reason of any flood, riot, fire, strike, explosion, war or any other cause beyond the control of ROLM, ROLM shall be excused from such performance to the extent that it is prevented, hindered or delayed by such causes. Upon the occurrence of any such events, ROLM shall use its reasonable efforts to notify Customer of the nature and extent of any such condition.

7. ROLM CORPORATION'S GUARANTEE OF MAINTENANCE AND SPARE PARTS

ROLM is a wholly owned subsidiary of ROLM Corporation. ROLM Corporation guarantees to Customer that ROLM Corporation or its designee will have available maintenance and spare parts for the Equipment for a period of at least ten (10) years from the Date of Cutover of the Equipment at Customer's Premises.

8. GENERAL

This Agreement shall be governed by the laws of the State of New York. Customer may not assign its rights or delegate its obligations under this Agreement without the prior written consent of ROLM. In the event of invalidity of any provision of this Agreement, the parties agree that such invalidity shall not affect the validity of the remaining portions of this Agreement, and ROLM and Customer agree to substitute for the invalid provision a valid provision which most closely approximates the economic effect and intent of the invalid provision. This Agreement represents the entire agreement between ROLM and Customer with respect to the maintenance of the Equipment, and supersedes any prior agreement and negotiations between the parties.

9. UNAUTHORIZED SERVICE

Unauthorized personnel making changes to the system or attempting service voids this contract.

	Unit Price	New	Per wire
STATION EQUIPMENT			
Single line telephone (1)	\$ 75	\$ 100	\$ 70
Five line, Key-ROLM (1)	700	115	80
Nine line, Key-ROLM (1)	770	115	80
Five Line, Key-Conventional (1)	190	155	70
Nine Line, Key-Conventional (1)	250	180	70
100 ETS	320	100	70
Key Service Unit (no power supply interrupter or cover)	325	165	-
KSU line card	40	25	-
KSU manual intercom card	30	25	-
CBX HARDWARE			
16 Channel Coder	650	25	-
16 Channel Decoder	600	25	-
16 Channel ETI Controller	4000	40	-
8 Channel Line card	750	25	-
4 Channel OPX card	600	20/OPX	-
4 Channel Key card	550	25	-
4 Channel Direct Trunk card	950	25/Trunk	-
8 Channel Tie Trunk card (with controller)	2300	40/Tie Trunk	-
8 Channel DID Trunk card (with controller)	3000	40/DID Trunk	-
Attendant Console	4000	100	40
48K Memory card	9250	100	-
12K Memory card	\$ 4000	\$ 100	\$ -
CBX SOFTWARE CHARGES			
Reconfiguration Charges	\$ 575; delivered 30 days from customer definition		
Additional Features	Per quote at the then current feature price list.		

NOTE 1. Price assumes standard building conditions. Additions greater than 5 telephones at any one time or additions that exceed the "wired for capacity" require pricing by quote only.

Normal working hours are 8-5 Monday through Friday; time and materials work will be done at the rate of \$36 per hour; an overtime rate of \$54 per hour will apply after hours and Saturdays. Sundays and holiday work will be charged at a \$72 per hour rate. All rates are quoted portal-to-portal.

EQUIPMENT, ENVIRONMENT AND OTHER SPECIFICATIONS

Those specifications required for operation of the equipment are

PRIMARY POWER	- Per Cabinet (other than VS)	- One dedicated 30 Amp. 208 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit - same phase - (terminated in twistlock outlet)
	- Per VS Cabinet	- One dedicated 20 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in twistlock outlet)
	- Per Console	- One 15 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in duplex outlet)
	- General Use	- One dedicated 20 Amp. 117 Volt AC $\pm 10\%$ 60 Hz $\pm 1\%$ circuit (terminated in double duplex outlet)
ENVIRONMENT (Operating)		
	- Humidity	- 30% - 60% relative humidity, nominal
	- Air Conditioning/Ventilation	- 6826 Blu/hr or 0.569 tons per cabinet (40° to 80° F or 4.4° to 26.7° C), nominal
		- For VSCBX - may require less air conditioning however, must be able to move a minimum of 400 Cubic Feet. at 80° F
ROOM SIZE	- Per Cabinet (other than VS)	- 59 in. (W) x 28 in. (D) x 65 in. (H) per cabinet
	- Per VS Cabinet	- VSCBX - 38 in. (W) x 28 in. (D) x 71 in. (H)
	- Per Console	- Plus 36 in. minimum work space surrounding cabinets
WEIGHT		- 1000 pounds per cabinet
CONDUIT		- Per console or telephone - 1/2 in. conduit minimum to equipment room
		- Distribution Frames - All distribution frames not located in the telephone equipment room require a conduit or raceway (per local code) of adequate size to lead to the telephone equipment room
OTHER	Floors	- Tile sealed concrete or stained wood
	Walls	- Sealed or painted
	Lighting	- 70 candle foot minimum

APPENDIX E: NORTHERN TELECOM SERVICE CONTRACT

SERVICE CONTRACT

Northern Telecom Inc., a Delaware corporation ("NT") and _____ a _____ ("Buyer") agree as follows:

1. SERVICE

NT will, at its option, either repair or replace ("Service") any component part of the hardware listed on Annex 1 ("Hardware") when it malfunctions.

2. SERVICE SITE, TERM AND CHARGE

The Hardware is installed at _____ ("Service Site"). NT shall provide Service at the Service Site for a period of one (1) year commencing on _____ ("Term"). The charge for Service during the Term shall be \$_____ per month, payable quarterly in advance, plus any applicable taxes. NT reserves the right during the Term or any renewal period to increase the charge for Service to reflect changes made during the Term or any renewal period in either the type or quantity of Hardware.

3. ROUTINE SERVICE

Routine Service shall be performed by NT between 8:00 A.M. and 5:00 P.M., Monday through Friday, except NT holidays. Repair personnel as are required shall be dispatched to the Service Site within twenty-four (24) hours of Buyer's request for routine Service, except when Buyer's request is made on, or on a day preceding, a holiday of NT's or a weekend. When the Buyer's request is made on, or a day preceding, a holiday of NT's or a weekend, repair personnel shall be dispatched to the Service Site on NT's next normal workday.

4. EMERGENCY SERVICE

Emergency Service shall be performed by NT promptly without regard to the time of day or the day of the week, including holidays, and repair personnel as are required shall be dispatched to the Service Site within two (2) hours of Buyer's request for emergency Service. An emergency shall be deemed to exist when problems incurred in using the Hardware [except for (a) isolated failures of individual telephones and (b) the failure of any other components of the Hardware which are not required for the processing or completing of telephone calls] materially interfere with the normal conduct of Buyer's business. A request for Service when an emergency does not exist shall be deemed to be a request for routine Service.

5. CONDITION OF SERVICE

NT's obligation to perform Service is conditioned upon the Hardware not having been altered or repaired by any party other than NT, without NT's written consent, and the malfunction not being the result of mishandling, abuse, misuse or improper storage, installation, maintenance or operation by other than NT (including use in conjunction with equipment electrically or mechanically incompatible) and upon the Hardware not having been damaged by fire, explosion, power failure, any act of God, or by any other cause whatsoever other than NT.

6. ADDITIONAL SERVICES

Upon Buyer's request, NT shall perform the installation of additions to the Hardware, moves and changes of the Hardware and the features associated therewith and the repair or replacement of Hardware which has malfunctioned as the result of any of the causes described in Section 5. These services ("Additional Services") which shall include services performed by NT pursuant to NT's "Customer Service Order" form shall be at Buyer's sole expense, at NT's applicable rates for material and labor therefor, and subject to the provisions of Sections 7 and 8. The charge for Additional Services shall be due and payable to NT within thirty (30) days of NT's invoicing therefor.

7. FORCE MAJEURE

If NT's performance under this Contract, or of any obligation hereunder, is interfered with by reason of any circumstances beyond NT's reasonable control, including without limitation, fire, explosion, power failure, acts of God, war, revolution, civil commotion, or acts of public enemies, any law, order, regulation, ordinance, or requirement of any government or legal body or any representative of any such government or legal body; labor unrest, including without limitation, strikes, slowdowns, picketing or boycotts; then NT shall be excused from its performance on a day-for-day basis to the extent of such interference.

8. REMEDIES AND LIMITATION OF DAMAGES, REMEDIES AND WARRANTIES

In the event of any material breach of this Contract by NT which shall continue for fifteen (15) or more days after written notice of such breach (including a reasonably detailed statement of the nature of such breach) shall have been given to NT by Buyer, Buyer's sole and exclusive remedy shall be to terminate this Contract by providing written notice thereof to NT.

In the event Buyer fails to pay the charge for Service or Additional Services when due, NT shall have the right to suspend its performance under this Contract upon providing written notice thereof to Buyer and/or to terminate this Contract if Buyer has not paid to NT all amounts due NT within fifteen (15) days of NT's written notice thereof.

In the event this Contract is terminated by either party, neither party shall have any further obligations to the other party except that NT shall refund to Buyer any portion of the charge paid for Service for the period subsequent to the effective date of termination less any amounts then due NT for Service and/or claim for Additional Services performed prior to such termination. Termination of this Contract by NT shall not constitute a waiver by NT for any amounts due NT for Service or Additional Services.

THE PARTIES AGREE THAT THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WRITTEN OR ORAL, ARE EXCLUDED FROM THIS CONTRACT AND SHALL NOT APPLY TO THE HARDWARE PROVIDED UNDER THIS CONTRACT WHETHER PROVIDED BY NT PURSUANT TO ITS OBLIGATIONS TO PROVIDE SERVICE OR ADDITIONAL SERVICES OR TO ANY SERVICE OR ADDITIONAL SERVICES PERFORMED UNDER THIS CONTRACT. NT'S OBLIGATION AND BUYER'S SOLE AND EXCLUSIVE REMEDY IN THE EVENT NT PROVIDES MALFUNCTIONING HARDWARE IS TO CAUSE NT TO PERFORM SERVICE ON SUCH MALFUNCTIONING HARDWARE. NT SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE WHATSOEVER FOR ANY BREACH OF THIS CONTRACT OR FOR ANY ACTION ARISING OUT OF ITS PERFORMANCE UNDER THIS CONTRACT.

9. RENEWAL

The charge for Service for the first and subsequent annual renewal periods shall be NT's then existing charge for Service. NT shall apprise Buyer at least thirty (30) days prior to the end of the Term or any renewal period of such charge and provide Buyer a revised Annex 1 or notify Buyer that NT shall not renew this Contract. Buyer shall sign the revised Annex 1 and return a copy of the revised Annex 1 to NT at least fifteen (15) days prior to the end of the Term or any renewal period. If NT has not received such Annex 1 from Buyer by such time, Buyer shall be deemed to have elected not to renew this Contract.

10. GENERAL

Buyer may not assign or transfer this Contract or any rights or obligations hereunder without the prior written consent of NT. This Contract constitutes the entire agreement between NT and Buyer with respect to the subject matter hereof and supersedes all previous negotiations, proposals, commitments, writings, and understandings of any nature whatsoever. Any changes to this Contract requested either by Buyer or NT may only be effected if mutually

agreed upon in writing by duly authorized representatives of the parties hereto. Failure by either party at any time to require performance by the other party or to claim a breach of any provision of this Contract shall not be construed as affecting any subsequent breach or the right to require performance with respect thereto or to claim a breach with respect thereto. Section headings are inserted for convenience only and shall not be used in any way to construe the terms of this Contract.

The rights and obligations of the parties and all interpretations and performance of this Contract shall be governed in all respects by the laws of the State of Texas except for its rules with respect to the conflict of laws.

Notices and other communications shall be transmitted in writing by certified U.S. Mail, postage prepaid, return receipt requested, addressed to the parties as follows and shall be deemed effective four (4) days after the date of mailing:

If to NT, to: Northern Telecom Inc.
1001 East Arapaho Road
Richardson, Texas 75081

Att: Contract Administration Department

If to Buyer, to: _____

Att: _____

IN WITNESS WHEREOF, the parties hereto have caused this Contract to be duly executed, such parties acting by their representatives being thereunto duly authorized.

NORTHERN TELECOM INC.

BUYER:

BY: _____
TITLE: _____
DATE: _____

BY: _____
TITLE: _____
DATE: _____

ANNEX 1

Name of Buyer: _____

HARDWARE

<u>Description of Hardware Components</u>	<u>Quantity</u>
1. PBX Systems (Type _____)	_____
2. Key Systems (Type _____)	_____
3. Instruments	
a. Single line telephone sets	_____
b. Premium telephone sets (multi-line)	_____
c. Trunks	_____
d. Consoles	_____
e. Intercom master phone	_____
4. Special Instruments	
a. Hospital Patient	_____
b. Hotel/Motel guest	_____
c. University dormitory	_____
5. CDR (Type: _____)	_____
6. Paging System	_____
7. Other (specify)	_____

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